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FOREST SURVEY RELEASE NO. 34 AUGUST 11, 1938

GROWTH AND DRAIN IN THE FORESTS OF CENTRAL AND SOUTHWEST MISSISSIPPI

A Progress Report

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by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge

Regional Survey Director

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FOREWORD

The nation-wide Forest Survey, being made by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies can be formulated for the effective use of land suitable for forest production.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

This release contains Forest Survey data that will be included in complete reports to be published later. It should therefore be regarded as a progress report. Although considered reliable, the data are subject to correction or amplification as the work of computation proceeds.

Staff Assignment

In Charge of Field Work and Preparation of Report
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GROWTH AND DRAIN IN THE FORESTS OF CENTRAL AND SOUTHWEST MISSISSIPPI

The part of Mississippi covered in this Release is designated as Survey Unit #3 and includes the upland portion of 28 central and southwestern counties lying east of the flood plains of the Mississippi and Yazoo Rivers (fig. 1). The aggregate area is 10,799,500 acres, 56 percent of which is forest land, 42 percent cropland and pasture, and the remaining 2 percent is used for miscellaneous purposes.1/ The field survey of this unit was made in 1935.

The principal cities are Jackson (the State Capital), Meridian, Vicksburg, and Natchez. In 1930 the total inhabitants of the unit numbered approximately 722,000, of whom 51 percent were negroes.

The land surface ranges from broad rolling prairies near Macon in the northeast to relatively high, hilly country south of Meridian and rough, deeply fissured bluffs near Natchez and Vicksburg. Drainage is principally southward through the Pearl and Pascagoula Rivers and westward through the Big Black and lesser tributaries of the Mississippi. Some form of active erosion, most of which occurs in the more rugged uplands bordering the Mississippi and Yazoo River bottomlands, is prevalent on 20 percent of the land area.

Five major interstate railroad systems, which touch the larger cities, are supplemented by several smaller lines, which serve the more rural counties in the unit. Water transportation is available on the Mississippi and Yazoo Rivers at Vicksburg; while Mobile, Gulfport, and New Orleans, all deep-water ports, are within one day's travel by truck or rail from every part of the area. Good paved highways join the principal cities, and a network of all-weather gravel roads serves the less populated sections.

Growing conditions are favored by a temperate climate. A frost-free season of 210 to 240 days with summer temperatures averaging about 80° F. is ideal for growth of both farm and forest crops. The annual rainfall averages around 55 inches, most of which falls in the winter and spring.

In 1935 more than 6 million acres of this Survey unit were classified as forest land, about 79 percent of which was in rolling uplands. These forests are dominated by stands of shortleaf and loblolly pine mixed with various hardwoods (fig. 1). In the southern counties, longleaf pine occurs in scattered stands often in mixture with other species. In the rough, loessal uplands bordering the Yazoo and Mississippi bottomlands, hardwood stands frequently dominate large areas.

1/ For a more detailed description of the physical features and forest resources of this section, see Forest Survey Release No. 24, "Sawtimber and cordwood volumes in central and southwestern Mississippi," Southern Forest Experiment Station, New Orleans, La., March 13, 1937.

The United States Forest Service has established the Homochitto National Forest in the southwest portion of the unit, with its center in Franklin County, and the Bienville National Forest between Jackson and Meridian, mostly in Smith and Scott Counties. The gross area, both private and Federal, included within the boundaries of these forests is 756,280 acres.

The forest area of the Survey unit was classified according to forest condition, based upon age and cutting history, as shown in table 1, where the dominant second-growth character of the present forest is at once apparent. It is significant that although less than 13 percent of the forest area was in the original old-growth condition, only slightly over 1 percent was classified as clear-cut.

Table 1. - Forest area classified according to forest condition

Forest condition	Acres	Percent of forest area
Old growth:		
Uncut	275,500	4.6
Partly cut	487,200	8.1
Total	762,700	12.7
Second growth:		
Sawlog size:		
Uncut	1,804,100	29.9
Partly cut	1,078,700	17.9
Under sawlog size	2,086,600	34.6
Reproduction	227,300	3.8
Total	5,196,700	86.2
Clear-cut	67,000	1.1
Total	6,026,400	100.0

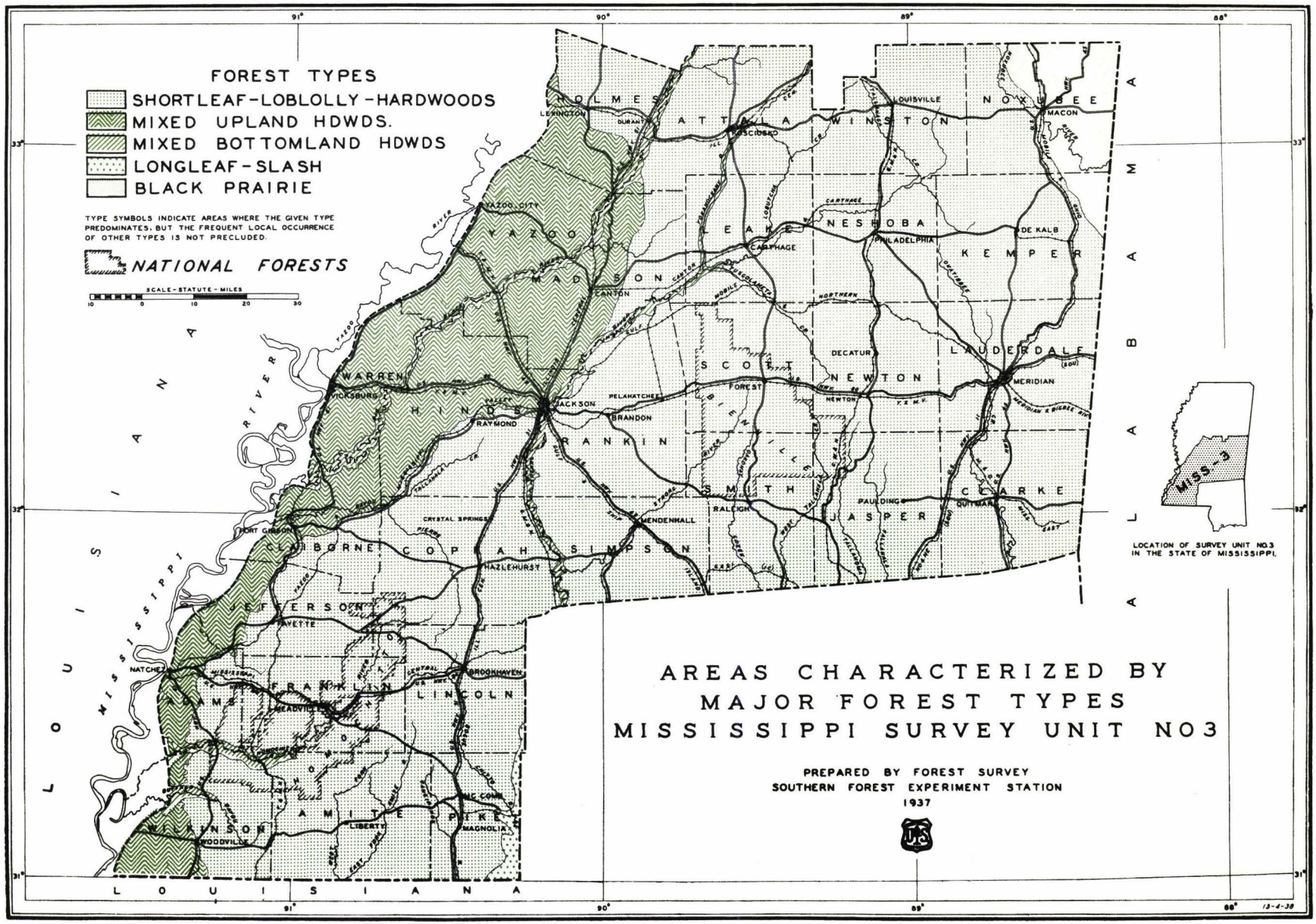

FIGURE 1.—FOREST TYPE MAP

Volume Estimates

Table 2 lists the net saw timber and cordwood volumes according to forest condition and species-group. The board-foot volumes are based on the International $\frac{1}{4}$-inch rule, which closely approximates green lumber tally. Allowance has been made for material that would be left in the woods because of rot, fire scar, crook, limbiness, and similar defects. Likewise, deductions have been made for mill cull, i.e., sweep and interior defects. A saw-timber tree contains at least one usable 12-foot log and will yield at least 50 percent of its gross volume in sound material. In the case of hardwoods the minimum breast-height diameter (at $4\frac{1}{2}$ feet above the ground) outside bark is 13.0 inches; in pines, 9.0 inches. Almost 73 percent of the board-foot volume is in second growth, and over 58 percent is included in the various pine species.

The cordwood volumes, which include a wider variety of material than the board-foot estimates and are measured in standard (4 x 4 x 8 feet) cords, are derived from the following sources:

1. From the merchantable stems of sawlog-size trees.

2. From that portion of saw-timber pines not used as sawlogs but usable as cordwood. This includes the upper stems to a variable top-diameter limit (but not less than 4 inches).

3. From the sound trees under sawlog size at least 5.0 inches d.b.h., in which the entire stem of all species is included to a variable top diameter (but not less than 4 inches).

Deductions for cull include only defects which cause the material to be unsuited for use as cordwood, i.e., sweep and slight crook are not deducted.

Table 2.- Net saw-timber (International $\frac{1}{4}$-inch rule) and cordwood volumes, by species-groups and forest conditions, 1935.

Species-group	Old growth		Second growth		Total	
	M bd.ft.	Cords	M bd.ft.	Cords	M bd.ft.	Cords
Pines	1,900,500	4,473,300	7,919,600	27,746,900	9,820,100	32,220,200
Pulping hardwoods	1,071,700	3,578,300	2,076,000	11,486,300	3,147,700	15,064,600
Nonpulping hardwoods	1,611,500	5,189,900	2,286,200	12,909,400	3,897,700	18,099,300
Total	4,583,700	13,241,500	12,281,800	52,142,600	16,865,500	65,384,100

All of the board-foot inventory volume shown in table 2 is not at present in sufficiently dense stands to justify cutting. Analysis of the ¼-acre sample-plot data bearing on all ages and conditions of sawlog-size stands in the pine and pine-hardwood types (excluding the longleaf pine type) discloses the percentage distribution of volume and area in stand-per-acre classes (fig. 2). This may be considered a superficial index to present economic availability. Approximately 78 percent of the forest area dominated by shortleaf and loblolly pine in mixture with hardwoods averages at least 2,000 board feet per acre. Moreover, 94 percent of the total board-foot volume occurred in stands of this same density. This situation is not static, however, since all areas where the growing stock is maintained are steadily increasing in volume per acre.

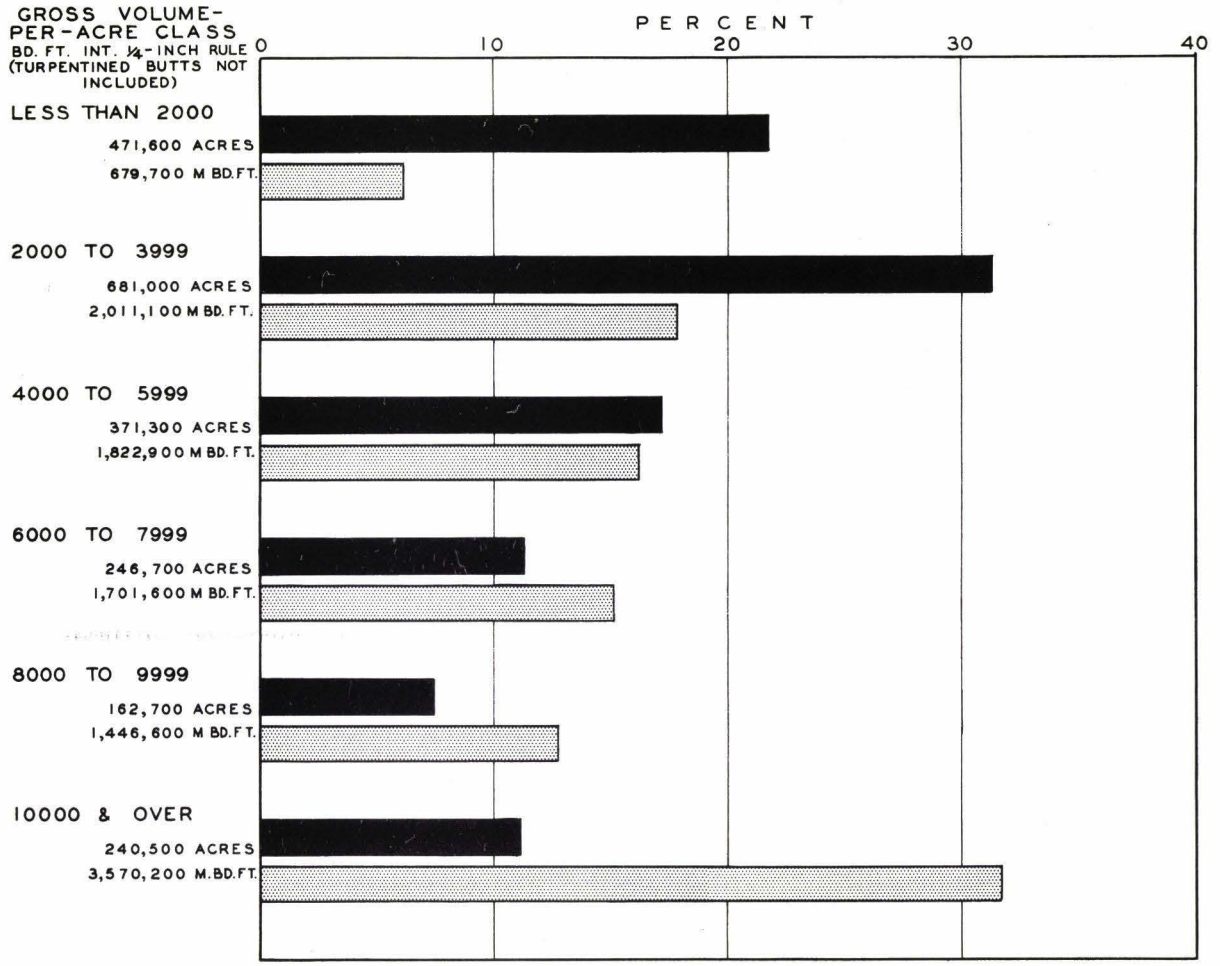

FIGURE 2 – PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS IN THE PINE AND PINE-HARDWOOD TYPE-GROUPS*, CLASSIFIED ACCORDING TO VOLUME OF SAWTIMBER PER ACRE.

*EXCLUDING LONGLEAF PINE TYPES

For purposes of comparison with other regions, the average volumes per acre (table 3) are significant. These data represent the average volumes of the component species-groups found on many scattered areas that have been grouped in a common condition.

Table 3. - Average stand-per-acre figures classified according to species-group and forest condition

Forest condition	Pines	Pulping hardwoods	Nonpulping hardwoods	Total
	Board feet (Int. $\frac{1}{4}$-inch rule)			
Old growth:				
Uncut	4,708	1,838	2,405	8,951
Partly cut	1,239	1,160	1,947	4,346
Second growth:				
Sawlog size:				
Uncut	3,113	699	720	4,532
Partly cut	1,707	639	711	3,057
Weighted average, all conditions[1/]	1,630	522	647	2,799

1/ Includes under-sawlog-size, clear-cut, and reproduction conditions.

Forest Increment

"Forest increment," as used in this release, means the difference between the net volume of good trees standing on the area at the beginning and the end of the year before deduction of the total commodity drain for the year. If the loss in volume during the year due to mortality, rot, or injury is equivalent to the increase due to growth, there will be no increment; and if these losses are greater than the increase due to growth, there will be a reduction in the growing stock in addition to that caused by commodity drain.

Board-foot increment is made up of the growth on sawlog-size trees and the total board-foot volume of trees becoming sawlog size during the year. Cordwood increment represents growth on the sound stem wood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion only of hardwoods 13.0 inches d.b.h. and larger. Included also is the total volume in pines and hardwoods that become 5 inches or larger during the year. In calculating both the board-foot and cordwood increment, cull material is excluded.

In order to arrive at an estimate of average increments for various conditions uninfluenced by cutting, the figures in table 4 were computed. These figures represent, therefore, the average increment that occurred on live trees on the area at the beginning of the year, reduction having been made only for mortality.

Table 4. - Average increment per acre in the various forest conditions (assuming no cut), 1935.

Forest condition	Pine component		Hardwood component		Total	
	Board feet	Cords	Board feet	Cords	Board feet	Cords
Old growth:						
Uncut	46	.01	115	.35	161	.36
Partly cut	35	.10	93	.32	128	.42
Second growth:						
Sawlog size:						
Uncut	197	.58	78	.34	275	.92
Partly cut	102	.27	72	.28	174	.55
Under sawlog size	66	.30	24	.27	90	.57
Reproduction and clear-cut	4	.01	2	.02	6	.03
Weighted average	105	.33	58	.29	163	.62

Total forest increment

During the year 1935 a total of 945,100,000 board feet was added to the growing stock through growth. About 47 percent of this occurred in the second-growth sawlog-size pine stands, while hardwoods in the same condition accounted for only 22 percent (table 5). Of the total cordwood increment (3,657,000 cords), 35 percent occurred in the second-growth sawlog-size pine stands.

Table 5. - Total board-foot and cordwood increment in the various forest conditions, 1935.

Forest condition	Pine component		Hardwood component		Total	
	M bd.ft.	Cords	M bd.ft.	Cords	M bd.ft.	Cords
Old growth	25,700	37,700	73,200	246,900	98,900	284,600
Second growth:						
Sawlog size	446,200	1,283,300	211,400	897,000	657,600	2,180,300
Under sawlog size	136,300	632,200	50,600	549,900	186,900	1,182,100
Reproduction and clear-cut	1,000	3,300	700	6,900	1,700	10,200
Total	609,200	1,956,500	335,900	1,700,700	945,100	3,657,200

Forest Industries

Following a preliminary survey in 1934, a more complete survey was made in 1937 of the wood-using industries in this part of Mississippi, covering the production of lumber, veneer, cooperage, and piece products for the calendar years 1935 and 1936. In addition, an estimate was made of the amount of pulpwood and of fuel wood cut for both commercial and domestic purposes.

There were 623 sawmills operating in central and southwestern Mississippi during some portion of 1936 (table 6), of which 578 are of the portable or semi-portable type; this type of mill produced 43 percent of the annual lumber cut and supplied 40 percent of the total man-days of employment provided by the lumber industry. Although the small mills are found in every county of the unit, they appear in greatest numbers in the northern and eastern counties (fig. 3).

Table 6. - Number of sawmills and man-days of employment, classified according to capacity of mill, 1936.

Rated capacity[1]/ (10-hour day)	Sawmills			Employment		
	Pine	Hardwood	Total	Woods	Mill	Total
M bd.ft.	-----	Number	-----	-----	Man-days	-----
Under 20	not classified		578	433,600	905,400	1,339,000
20 - 39	19	11	30	167,700	267,500	435,200
40 - 79	8	2	10	242,600	436,600	679,200
80 and over	5	-	5	406,200	496,800	903,000
Total			623	1,250,100	2,106,300	3,356,400

1/ Rated capacity indicates size of mill rather than actual average production.

There were 35 nonlumber plants in the territory covered by this release during 1936, including veneer mills, cooperage and treating plants, and miscellaneous plants manufacturing shuttle blocks and ski and furniture blanks (fig. 3). Their production in 1936, together with the employment provided by them, is indicated in table 7. These plants provided only 10 percent of the total man-days of employment in the wood-using industries in 1936. The total man-days of employment involved in the production of cross ties, poles, pulpwood, fuel wood, and fence posts is estimated to exceed that in all other nonlumber industries combined. Of these perhaps the least commercial in nature is fuel-wood cutting. While some of the fuel-wood volume shown in table 7 is produced and sold as a commercial enterprise, 90 percent of it is cut by the consumer. It is interesting to note that although no pulp mills or distillation plants are located in this unit, there was a substantial amount of employment provided in cutting pulpwood and producing distillate wood for outside consumption.

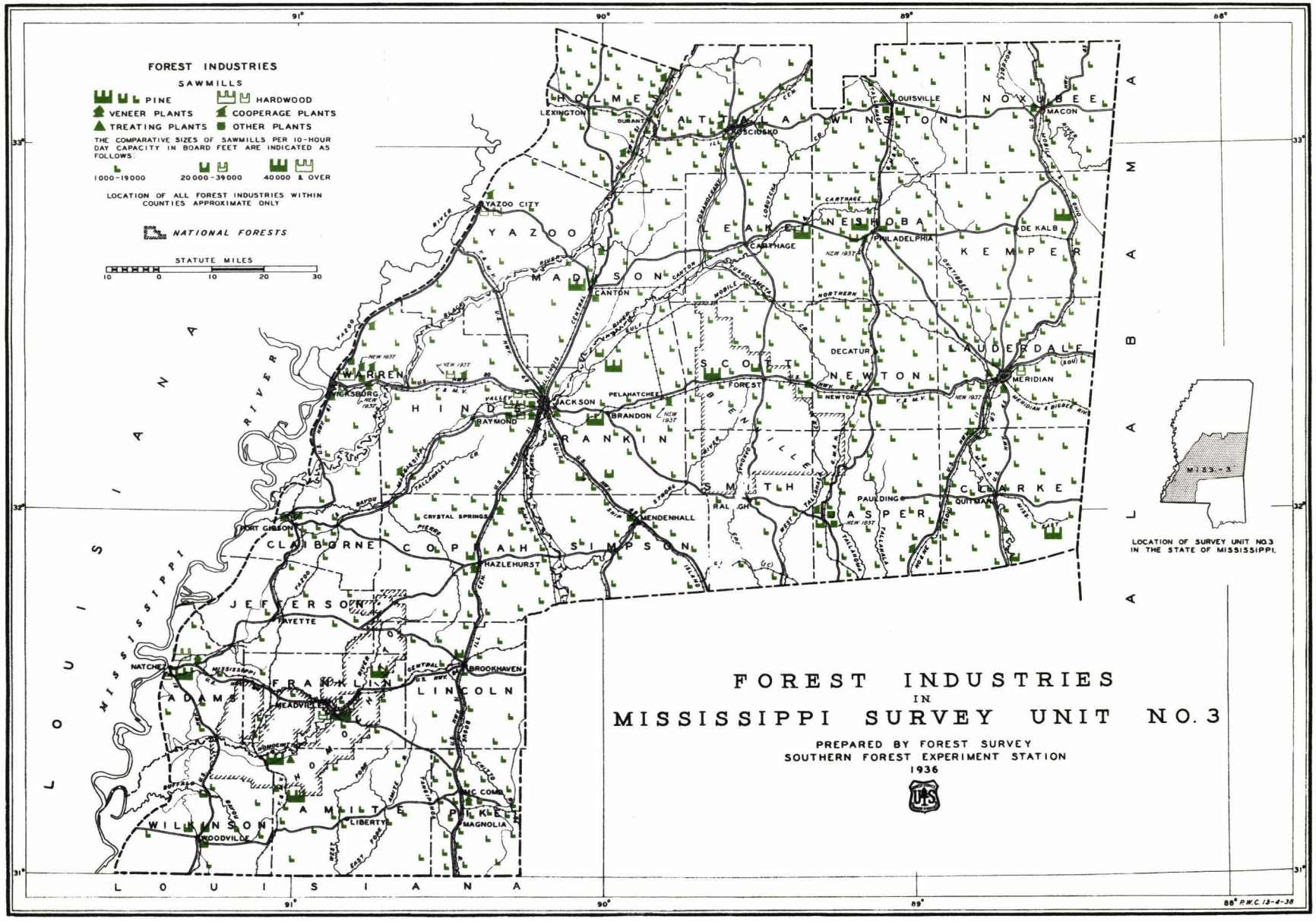

FIGURE 3.- FOREST INDUSTRIES MAP

Table 7. - Production and employment in the woods-products industries, 1936

Industry or commodity	Number of plants	Units produced	Man-days employment (10-hour day)		
			Woods	Plant	Total
		M bd.ft.			
Lumber	623	965,500	1,250,100	2,106,300	3,356,400
Veneer	8	43,200	44,200	283,700	327,900
		Pieces			
Cross ties	-	994,000	140,200	-	140,200
Fence posts	-	5,662,000	65,800	-	65,800
Poles and piles	-	137,000	26,400	-	26,400
		Cu.ft.			
Treating plants	5	4,180,000	-	44,600	44,600
Distillation plants	-	-	13,400	-	13,400
		Cords			
Pulpwood	-	-	189,000	-	189,000
Cooperage	13	69,600	65,400	96,000	161,400
Fuel wood	-	1,295,700	990,300	-	990,300
Miscellaneous mfg.	9	9,600	10,800	12,300	23,100
Total			2,795,600	2,542,900	5,338,500

Commodity Drain

Annual commodity drain is the wood volume removed (including woods waste) during 1 year from the forests of this Survey unit by the various wood-using industries and activities. The board-foot and cubic-foot volumes shown in table 8 represent the drain on the forests of this unit for 1936. The great majority of this material is, of course, manufactured or processed within the unit, but there is a substantial quantity which moves across the Survey unit boundary for consumption outside. All wood cut from sawlog-size trees, regardless of the ultimate commodity into which it is manufactured, is indicated in the board-foot column. The cubic-foot figures include all the material in the board-foot entries, the cubic-foot material in the upper stems of sawlog-size pines, and the cubic-foot contents of the main stems of good trees at least 5.0 inches d.b.h. but under sawlog size. Under miscellaneous drain are included the volumes chargeable to land clearings, domestic farm use, fence posts, and miscellaneous nonlumber manufacturing.

Comparison of Volume Increment with Commodity Drain

In table 9 are compared the two opposing forces that cause the status of the the forest resources to change from year to year. The total growth is balanced against the losses from the stand due to both natural and man-made causes. The chief loss, or drain, is caused by cutting for wood products — cutting, which during 1935 and 1936 and probably for several decades past, has exceeded the total increment during the same period. In 1935 the drain exceeded the increment by nearly 400 million board feet, and during the following year the growing stock was again reduced by more than 580 million board feet.

Table 8. - Commodity drain from good trees expressed in board feet[1] and cubic feet[2] 1936

Commodity	Species-group		Total	Species-group		Total
	Pine	Hardwood		Pine	Hardwood	
	M board feet			M cubic feet		
Lumber	795,600	294,800	1,090,400	147,570	45,870	193,440
Veneer	6,400	24,400	30,800	1,090	3,520	4,610
Cooperage	1,200	37,300	38,500	250	5,800	6,050
Pulpwood	40,800	1,000	41,800	12,740	360	13,100
Fuel wood	83,400	121,100	204,500	21,730	19,070	40,800
Poles and piles	12,400	200	12,600	2,320	30	2,350
Cross ties	29,700	23,900	53,600	5,480	3,840	9,320
Miscellaneous	22,900	25,400	48,300	6,690	9,160	15,850
All commodities	992,400	528,100	1,520,500	197,870	87,650	285,520

[1] International $\frac{1}{4}$-inch scale
[2] Inside bark

A similar comparison on the basis of cubic-foot volumes shows a somewhat different picture. The rapid growth accruing to the under-sawlog-size trees, plus the volume in the young trees which become 5.0 inches or larger in diameter during the year, was sufficient to exceed the total cubic-foot drain on the forest in 1935, but fell short by almost 16 million cubic feet in 1936.

Table 9. - Comparison of increment with commodity drain, 1936

Item	Sawlog-size trees			All growing stock 5 inches d.b.h. and larger
	Pine	Hardwood	Total	
	M board feet (Int. $\frac{1}{4}$-inch scale)			M cubic feet (i.b.)
Growing stock, Jan. 1, 1936	9,581,100	6,897,100	16,478,200	4,627,320
Growth	691,500	392,200	1,083,700	317,080
Mortality	83,800	60,100	143,900	47,480
Net increment	607,700	332,100	939,800	269,600
Commodity drain	992,400	528,100	1,520,500	285,520
Net change in growing stock	-384,700	-196,000	-580,700	-15,920
Growing stock, Jan. 1, 1937	9,196,400	6,701,100	15,897,500	4,611,400

A serious overcut in board-foot material is thus taking place in this unit each year. The comparison of volume increment with commodity drain for the year 1936 is graphically portrayed in figure 4.

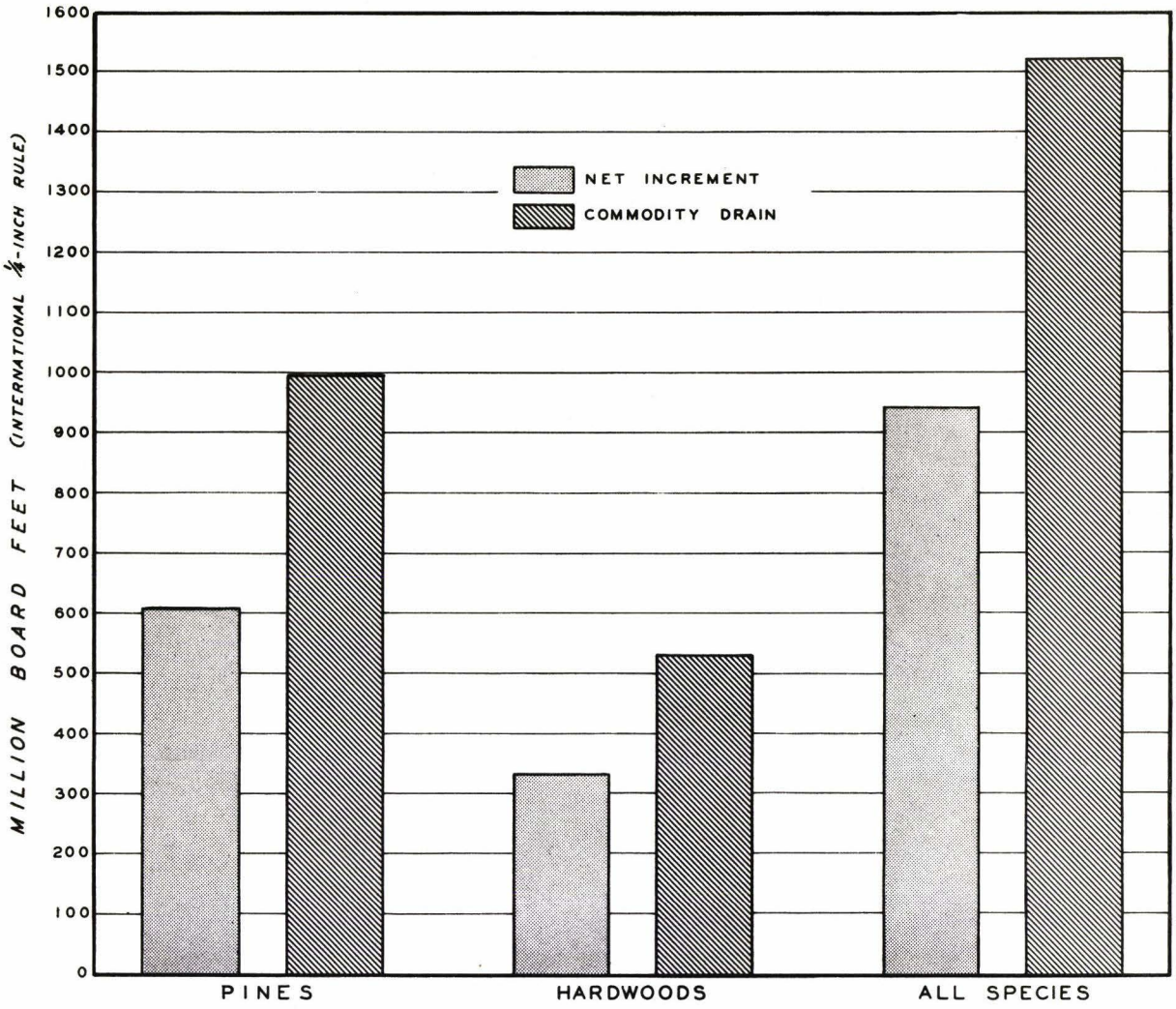

FIGURE 4 – COMPARISON OF NET INCREMENT OF SAWLOG-SIZE MATERIAL WITH COMMODITY DRAIN, 1936

I. 9	AUTHOR Southern Forest Survey Release #34
7624F	TITLE Outlook & drain in the Forests of Central & Southwest Miss. Alex Eldredge, I. F. Aug. 11, 1938
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Conclusions

The forest situation in this unit is, in several respects, similar to that existing in many southern forest areas today. Of the total land area, approximately 56 percent is forested and is occupied principally by second-growth stands of loblolly and shortleaf pine, frequently mixed with hardwoods. A small acreage of old-growth timber remains in widely scattered patches. Most of the forest acreage is owned by farmers and other private individuals holding less than 5,000 acres each.

The total drain on the forests, especially that caused by small sawmill operators and contractors for cordwood material, is constantly reducing the growing stock. Indications are that this reduction in the growing stock has been taking place for several years. In 1935, for example, the over-cut amounted to nearly 400 million board feet, and during 1936 the inventory was reduced by approximately 580 million board feet. To continue to cut more each year than is grown can lead only to serious curtailment among existing wood-using industries, decreased employment, and a progressive depreciation of timber quality. This part of Mississippi has a severe unemployment problem to solve. The Federal unemployment census of Nov. 1, 1937,[2/] records a total of approximately 70,000 people that were totally unemployed, working on relief projects, or working only part of the time. Possibly the most promising solution to this problem is the immediate inauguration of an intensive, organized effort to develop the forest resources.

Although serious over-cutting obtains at present, the natural growing conditions are so favorable that it is possible to increase the forest increment so as to bring about a favorable balance of growth and drain and to reverse the present downward trend in supply. If the potentialities of the forest area are to be fully utilized, fire protection must be intensified and extended to unprotected lands; while the present growing stock which must be increased both in volume and quality, should be carefully utilized through selective cutting, removal of cull trees and inferior species, and thinning of stagnated stands. Poorly stocked areas and abandoned fields, on which the establishment of natural restocking will be doubtful or long delayed, should be planted in commercially valuable species. Furthermore, extension work on a scale far greater than that now existing, and designed to reach the small landowners and timber operators, will be required.

Many improvement measures have already been inaugurated on Federal and state holdings, and on a small part of the private ones, but a much more widespread acceptance and practice of these principles must be achieved if the forest resource is to be rehabilitated. The success of the measures already applied indicate clearly that when principles of sound woodland management are applied generally to the forests of central and southwest Mississippi, they will contribute a much larger share than at present to the maintenance of the people and the communities dependent upon them.

2/ Preliminary report on total and partial unemployment, John D. Biggers, Administrator, Washington, D.C., 1937.